ERS International congress, Madrid, 2019: Highlights from the General Pneumology Assembly

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Abstract

This article contains highlights and a selection of the scientific advances from the European Respiratory Society's General Pneumology Assembly that were presented at the 2019 European Respiratory Society International Congress in Madrid, Spain. The most relevant topics from the different groups will be discussed, covering a wide range of areas including rehabilitation and chronic care, general practice and primary care and M-health and E-health. In this review, the newest research and actual data as well as award-winning abstracts and highlight sessions will be discussed.

Short abstract

A highlights review of selected presentations from #ERSCongress 2019 by the @ERStalk General Pneumology Assembly.

Introduction

The European Respiratory Society International Congress is the world's largest scientific and educational conference in the field of respiratory medicine. For the Madrid 2019 Congress, 4,315 abstracts were accepted for presentation. The General Pneumology Assembly of the European Respiratory Society (ERS) is the largest of the 14 assemblies. In total 317 abstracts were presented in 20 sessions related to this assembly and the 4 groups of which it consists. It is impossible for any delegate to follow all scientific and clinical advances and breakthroughs presented during this conference. This review aims to provide the esteemed reader with an overview of a few of the most interesting presentations of each group, deemed noteworthy by the authors of this manuscript.

Pulmonary rehabilitation and chronic care

Session: Best abstracts in pulmonary rehabilitation and chronic care

The researchers of this session presented works on various important issues in pulmonary rehabilitation (PR), ranging from optimizing and maintaining the effects of exercise training to behavioral changes.

Because exercise intolerance often goes hand-in-hand with hypoxemia in patients with idiopathic pulmonary fibrosis (IPF), devices allowing a higher O_2 flow are of interest. *Schneeberger et al.* [1] compared a novel device of supplemental oxygen therapy (SOT), the Oxymizer®, to the conventional nasal cannula (CNC) in 26 IPF patients with SOT indication. 22 patients completed two endurance shuttle walk test using, in a randomized cross-over design, both Oxymizer or CNC. The use of Oxymizer® instead of CNC improved walking capacity and SpO_2 and was associated with lower heart and breathing rate. Despite these effects, a majority of patients (64%) still preferred the CNC for daily use. The authors concluded that offering SOT through Oxymizer® could provide clinically relevant benefits for IPF patients.

Additional prognostic information in COPD patients can be provided with the assessment of functional and exercise capacity but, this assessment is difficult to implement in care context. Thus, *Walsh et al*. [2] aimed to test the prognosis value of 4 metre gait speed (4MGS) in a cohort of 371 patients with COPD attending hospital outpatient clinics. In a multivariate analysis, they compared the predictive values of 4MGS, Age, FEV1 and Sex (GAFS) index to the Age Dyspnoea Obstruction (ADO) index and FEV_1. GAFS was predictive of 3-years mortality with a better discrimination than the other indexes, with an area under the curve (AUC) of 0.74. The model was also validated in an independent cohort of 472 patients attending community COPD clinics. The AUC for this cohort was 0.74. The authors concluded that gait speed can provide additional prognostic information than ADO or FEV1 alone in COPD patients, in a feasible manner.

Duarte-Natália et al. [3] conducted a randomized-controlled trial to investigate whether a behavioral change intervention can improve asthma control through an increase of physical activity levels (PAL). Control group (CG) and intervention group (IG) followed the same usual care intervention, with an addition of 8 weeks of behavioral change intervention focused on goal-setting and feedback for the IG group. The intervention had significant beneficial effects compared to CG on asthma clinical control, health related quality of life and PAL. Because improvement in asthma clinical control and PAL were correlated, the authors suggested that beneficial effects of the behavioral change intervention on asthma clinical control were mediated by PAL increase.

A randomized double-blind, cross-over, study conducted by *Bonnevie et al.* [4] aimed to investigate whether non-invasive high and/or low frequency lumbar transcutaneous electrical nerve stimulation (HF or LF TENS) can improve endurance capacity of COPD patients, as previously shown with intrathecal administration of fentanyl. To meet these objectives, 10 COPD patients performed in a randomized order 3 constant workload exercise associated with 3 modalities of stimulation, a sham TENS, a LF TENS at 4Hz, or a HF TENS at 100 Hz. LF and HF TENS did not induce differential effects compared to the sham condition on dyspnea, lower limb fatigue and endurance capacity. However, muscle oxygenation tended to be higher in both TENS conditions compare to sham, reflecting, according to the authors, a modulation of the quadriceps muscle activity.

While muscle dysfunction is well described in COPD patients, evidence regarding temporal muscle mRNA responses to both aerobic exercise training (AET) and training cessation (TC) are lacking. *Latimer et al.* [5] conducted a trial in 19 COPD patients and 10 healthy controls (HC) investigating mRNA response after 1, 4 & 8 weeks of AET and 4 weeks after TC. 94 mRNAs

involved in the response to AET were quantified with RT-qPCR from muscle biopsies performed at each time. The authors observed a lack of increase in VO_{2PEAK} following exercise training in COPD patient compare to HC. However, the muscle mRNA levels were altered in a similar manner in COPD patients and HC in response to AET and TC. The authors concluded that skeletal muscle mRNA responsiveness to AET was not blunted and dissociated from the whole-body VO_{2PEAK}.

A survival advantage has been described before for COPD patients who completed pulmonary rehabilitation (PR). Extracting the data from the Office for National Statistics concerning Wales and England from Jan 2015 to Jan 2017, *Evans et al.* [6] aimed to identify whether the case-mix severity differences or the effects of PR themselves explained this advantage. 7092 COPD patients were included. 58% of the patients completed PR and these patients differed from the non-completer group on age, dyspnea, comorbidities occurrence, walking distance, home oxygen use, smoking status and hospital admission. The mortality rate was lower in the completer group even with an adjustment on the parameters described above. This study described a higher cumulative mortality in patients who did not completed PR, HR 1.42 [1.20 to 1.67], after adjustment for confounding factors.

While the beneficial effects of PR in COPD patients are well described, little is known about strategies allowing long term maintainenance of these benefits. *Blervaque et al.* [7] assessed the efficiency of a pragmatic maintenance program in COPD patients, with a follow-up of 5 years. This program included weekly supervised exercise training sessions completed with discussion groups and health education. 144 COPD patients were included. The significant benefit provided by the PR on 6MWD remain significant up to 48 months after the PR discharge in the COPD patients involved in the maintenance program. In the same way, the benefits on dyspnea (MRC scale) and quality of life (VQ11 questionnaire) were maintained up to 5 years and 4 years respectively.

General Practice and Primary care

Session: Diagnosis and assessment of airway diseases in primary care

There was a wide range of primary care content at the 2019 ERS Congress. The Primary Care Day focussed on infections, vaccinations, and case studies with excellent speakers on day-to-day respiratory cases. Our highlights this year come from the primary care oral presentations on Sunday 29th September, showcasing research into the diagnosis and assessment of airway diseases.

Benítez Pérez et al., [8] explained that spirometry training in Mexico is optional, and rarely performed in primary care. Addressing this, an education programme was delivered to 439 primary care clinicians. Initial testing identified 33% of participants did not know how to perform spirometry, and 37% had no equipment. The education programme demonstrated a great improvement in participant knowledge. A second phase of training including certification of spirometry was delivered 10 months later, however, due to high staff turn-over, only 70 of the original participants attended. Future research will consider condensing education and certification into one instalment and increasing spirometry availability.

In the Netherlands, spirometry is straightforward to achieve, but the quality compared to American Thoracic Society (ATS)/European Respiratory Society (ERS) standards [9] is unclear. To investigate, van de *Hei et al*., [10] assessed usefulness and quality of spirometry from 149 primary care patients. 88% of spirometry readings were considered 'clinically useful' by clinicians (two pneumonologists, 15 GPs), meaning they felt able to make a diagnosis from spirometry and available clinical data. However, when compared to the ATS/ERS standards only 13% of readings met the full criteria. Furthermore, when clinician diagnoses were compared, there was little agreement between the pulmonologists (kappa=0.38 95%CI 0.27 to 0.50), or between general practitioners and pulmonologists (vs pulmonologist 1 kappa=0.39 95%CI 0.22 to 0.44; vs pulmonologist 2; kappa=0.44 95%CI 0.32 to 0.55). These data suggest that meeting the ATS/ERS criteria was not necessary for clinicians to feel confident in making a diagnosis, though agreement between pulmonologists and between pulmonologists and GPs was poor.

Even if spirometry quality is sufficient, demonstrating expiratory airflow limitation in asthma can be difficult. Bronchial provocation can be useful in the diagnostic assessment of asthma [11] but is traditionally performed in hospitals [12]. Therefore, *Bins et al*., [13] investigated the safety and usefulness of community performed bronchial provocation in a Dutch primary care diagnostic centre. 998 patients underwent histamine bronchial provocation with no adverse events. The authors concluded bronchial provocation of adults in the community was safe and feasible, could reduce the number of referrals to secondary care and that under- and over-diagnosis of asthma occurred if bronchial provocation was not used.

Objective tests are also used to monitor asthma control. To monitor children, guidelines recommend measuring lung function routinely and, in some circumstances, Fractional exhaled Nitric Oxide (FeNO) [14,15]. Spirometry and FeNO are used regularly in hospitals but less commonly in primary care. To investigate the value of spirometry and FeNO for monitoring asthma in primary care children, *Lo et al*., [16] trained staff in 10 general practices to perform the tests in the United Kingdom. Of the 612 children recruited with 'GP diagnosed asthma' or 'suspected asthma', 575 achieved spirometry and 472 completed FeNO. 46% of children with available FeNO and spirometry reported good control (Asthma Control Test (ACT)/Children's Asthma Control Test (CACT) >19) but had at least one abnormality identified by objective tests. Interestingly, 49% of the 191 reporting poor control (ACT/CACT ≤19), had normal spirometry and FeNO <35. These data suggest that assessing asthma in primary care using symptoms, or objective tests in isolation will not provide a full picture of the child.

Two studies considered how to optimise management of adults with COPD. Firstly, *Baron et al*., [17] investigated asthmatic traits in 3532 individuals with pulmonologist-diagnosed COPD or Asthma COPD Overlap (ACO). Over 60% had at least one 'asthma sign'. 7% had a history of asthma, 13% had reversibility of ≥12% and 16% had atopy. They concluded that asthma traits could help primary care clinicians consider which individuals with COPD are most likely to benefit from inhaled corticosteroids [18]. Secondly, *Jordan et al*. [19] presented a prediction model to identify COPD patients at risk of hospitalisation. Age, COPD Assessment Test score, percentage of predicted Forced Expiratory Volume in 1 second, respiratory admissions in the past year, BMI and diabetes were valuable predictors for an individual being admitted within 2 years. The model performed well (c-statistic 0.75, 95%CI 0.72 to 0.79) and will be externally validated.

The final abstract investigated the value of the STOP-BANG questionnaire (SBQ) [20] in identifying individuals with Obstructive Sleep Apnoea (OSA). *Plana Pes et al*., [21] recruited 565 primary care adults (30-70 years). 38% scored ≥3 on the SBQ and underwent home polysomnography. Of these, 93% were diagnosed with OSA. The team concluded an SBQ ≥3 could be an adequate threshold to screen for OSA in primary care.

Overall, the session highlighted the breadth of research topics and methods used to investigate clinical questions arising from primary care. Learning from researchers across different countries helped address shared goals and challenges arising from efforts to maximise the value of new and existing questionnaires, models and tests to improve the diagnosis and management of respiratory disease.

M-health/E-health

Session: M-health/E-health poster discussion session

This year the ERS experienced the birth of the special interest Group M-Health/e-health, in the General Pneumology Assembly. This new group actively invites respiratory researchers, scientists, patient organisations, industry representatives, technicians and statisticians with experience in digital technologies to become a part of this movement and to contribute with their specific knowledge. At the M-Health/e-health poster discussion session, we got a marvellous first glimpse of the future of respiratory medicine and were provided with a selected sample of current initiatives.

Telemedicine

Telemedicine is a very promising field of medicine, especially for hospitals caring for rural areas, because it provides a way to overcome travelling distances. Additionally, it allows for further communication and checks, which would not be convenient in a regular setting. During the session *de las Heras et al*. presented the results of a randomized controlled trial in patients with idiopathic pulmonary fibrosis (IPF) comparing usual care to Tele-rehabilitation with a Virtual Autonomous Physiotherapist Agent (VAPA), on exercise capacity and quality of life [22]. They showed that Tele-rehabilitation with VAPA is feasible for IPF and found a significant difference in the 6-minute walking distance. *Vilarinho et al.* presented the results of the introduction of continuous telemonitoring in home-mechanical ventilation. In 8% of patients, they found a clinically relevant situation to act, which could be solved with just a phone call in 87% of cases [23]. This telemedicine troubleshooting could enhance the compliance of long-term therapy in Home Respiratory Therapies.

Health apps

In recent years, taking into account the growing number of smartphone users, we have seen apps rapidly taking on a central role in people's lives. They can be used to promote self-

management, follow-up disease outcomes, early detect deterioration and provide information on a variety of issues. At our session, *Rijssenbeek-Nouwens* et al. showed that quality of life and asthma control remained at a higher level in asthma patients after pulmonary rehabilitation if they used an e-health support platform compared to those who received usual care. Interestingly, this was particularly so for high engagers of the e-health system, suggesting that this is an important parameter to measure [24]. *Amaral et* al. displayed a beautifully created app for children, making use of gamification to increase adherence [25]. Children had to perform a forced expiratory manoeuvre that was registered by their smartphone's microphone. This resulted, if performed properly, in a dragon creating a huge fireball, which blew away a structure and interestingly, if performed sub-optimally, in smaller fireballs. The use of the app meant children performed spirometry unknowingly, and optimal performance was incentivised, in an intuitive and fun way. *Puig Sanchez et al.* presented trial results comparing a newly developed stop smoking app to usual care [26]. It included motivational texts upon request and mini-games, which patients could start when they felt the need for a smoke. They showed significantly increased cessation rates, which was all the more impressive considering most patients in the intervention group hardly used the app. A low uptake in app usage was a common feature across different presentations. Future research should focus on user-engagement from the start, for example by incorporating end-users in the design phase of the app.

Devices

The stethoscope is one of the defining features of the doctor, featuring prominently around the neck in movies or television series that include doctor. But, what if this stethoscope doesn't actually need the doctor anymore? This is the central question that *Grzywalski et al.* sought to answer by assessing multiple respiratory sounds with plug-in stethoscopes with automatic sound detection and analysis [27]. This automated device was significantly better at detecting different respiratory sounds than doctors. Fortunately, health professionals are still required to interpret the plug-in stethoscope in the context of medical history and other tests. However, it does paint a future whereby the actual presence of the patient inside the hospital might no longer be required for all diagnostics. Another important area of innovation is the emergence of Quantified Self and the use of all sorts of wearable. *Mannée et al.* presented the first model of an easy to use smart shirt, specifically designed to assess tidal volumes during different types of daily activity [28]. This could be used at home instead of having to come to the clinic for exercise testing.

Arteficial Intelligence (AI)/Big data

Arteficial Intelligence and machine learning techniques are of great interest for many involved in mhealth. Of course, it presents a very promising new field of medicine, with hopeful reports of earlier detection and more personalised treatment of all sorts of diseases. *Demchuk et al.* showed an automated decision support system providing personalised treatment advice for pneumonia, taking into account all comorbidities and interactions with other medication [29]. This resulted in significantly fewer medication errors. However, the use of AI in medicine is

certainly not a field without controversy. AI provokes interest as it is potentially superior to existing methods of analysis but also uncertainty as data analysis by neural networking is not well understood. This poses the question: "Should we follow the advice of a system if we do not understand how the system came to that advice?" Interestingly, *Das et al*. presented a new type of pulmonary function interpretation algorithm that shed some light on which determinants played a role in AI decision making and provided a new score that gives an indication of whether AI is right or not [30]. Hopefully, with further development , we can get more of a grip on how to use AI in the future and understand it better.

The ERS Congress 2019 has been of great interest for those engaged in digital medicine. As well as presentations, the new Group M-Health/E-Health had their first meeting and shared ideas for next years' conference, to present in the digital health sessions.

Concluding remarks

The authors of this article hope that this short summary of the impressive amount of lung research and advances in pulmonary care presented through the General Pneumology Assembly of the ERS creates curiosity to follow up on topics of interest to each individual reader.

It was our goal to stimulate discussion and exchange of scientific novelties and clinical developments. We also hope to have encouraged the readership to attend the ERS International Congress 2020 in Vienna.

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